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By-Kaufman, Jacob J.

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It is the purpose of this paper to discuss cost-benefit analysis in terms of: (1) its logic and meaning, (2) some of the misconceptions which prevail concerning this method of evaluation, (3) some of the problems and limitations of this method, and (4) the conclusions of a study which attempted to determine whether or not there is pay-off from an investment in vocational and technical education. Cost-effectiveness analysis is an attempt to establish the equivalent of a system of market principles for various types of government activities. One should not talk about education in terms of cost or needs alone. No cost can be justified without a reference to pay-off, and the satisfaction of any need cannot be justified without reference to cost. Cost-benefit analysis forces administrators to think through their objectives, concentrate on cost, and think in terms of alternatives. Some misconceptions are: (1) It seeks to conduct education on a least-cost basis. (2) Benefits are measured only in dollar terms. (3) Some things are not quantifiable. (4) The technique has not been fully developed, and (5) It tends to ignore political considerations. A Pennsylvania study was reported which revealed certain values of vocational-technical programs over other high school curriculums. (DM)

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by

Jacob J. Kaufman

Professor of Economics and Director,
Institute for Research on Human Resources
The Pennsylvania State University

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Cost-Effectiveness Analysis as a Method for the Evaluation of Vocational and Technical Education*

It is the purpose of this paper to discuss cost-benefit analysis in terms of (1) its logic and meaning; (2) some of the misconceptions which prevail concerning this method of evaluation; (3) some of the problems and limitations of this method; and (4) the conclusions of a study, conducted by the Institute for Research on Human Resources at The Pennsylvania State University, which attempted to determine whether or not there is pay-off from an investment in vocational and technical education.

Logic and Meaning of Cost-Benefit Analysis

Under a free enterprise economy most private wants are satisfied through the workings of the market mechanism. Under this system it is assumed that, as a result of consumer choice, goods and services will be produced to satisfy these private wants and that the limited resources of the economy will be allocated through the operations of the market in a manner which will yield the greatest output with a minimum use of resources.

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. There are, on the other hand, certain needs and wants which cannot, (or society prefers not to) be satisfied by the private sector. Certain wants, described as social wants, are those which "must be satisfied by services that must be consumed in equal amounts by all." These services are such that some people can benefit from them even if they do not pay for them. And there is no reason to think that such persons would make voluntary payments. Governmental expenditures of this type might include expenditures for flood control, defense, sanitation, etc.

Another group of wants which could be provided by the private sector but, for a variety of reasons, are handled by the public sector because society considers them meritorious, may be referred to as "merit" wants. Included in this category are such items as low-cost housing and "free" education. In these instances the wants could be satisfied by the private sector but society apparently thinks that there are certain social benefits which flow from these activities and therefore society should assume the responsibility to satisfy these wants.

It is not the purpose of this paper to discuss the pro's and con's of whether the government should concern itself with these "merit" wants. But it is the purpose of this paper to concern itself with the method by which it can be determined whether the provision of certain social and merit wants by the government are carried on efficiently, consistent with the objectives for which it has assumed the responsibility. And by efficiency is meant the attainment of an objective at the lowest possible cost.

In the private sector of the economy the market place, in general, is the place where these evaluations take place. The inefficient firm may have to go out of business. The firm that does not produce goods and services which satisfy the needs of the consumers may not survive. But what tests for efficiency and survival do we have when the government provides the goods and services?

The only alternative to the market place for the purpose of testing the efficiency of production or the quality of the product is by cost-benefit or cost-effectiveness analysis. Such an analysis is nothing more than an attempt to establish the equivalent of a system of market principles for various types of government activities. It might be reasonable to assert that the method of analysis is crude and that adequate data are not available. Such charges, however, do not negate the necessity to develop appropriate tools and to obtain data to judge a particular government activity.

The fact is that there is a tendency on the part of some educators to talk simply in terms of the "needs" of education. Their position is simple: the governmental agency should raise whatever funds are necessary to meet these "needs". On the other hand, there are some politicians who assert that there is a fixed sum of money available for educators to spend on education. The fact is that one should not talk about education in terms of cost or needs alone. No cost can be justified without a reference to payoff. And the satisfaction of any need cannot be justified without reference to cost.(1)

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(1) See Charles J. Hitch and Roland N. McKean, The Economics of Defense in the Nuclear Age, Atheneum Press, New York, 1965, pp. 46-47.

This means that one cannot discuss the need for or the payoff from vocational education without relating them to costs. Nor can one talk about the costs of vocational education without relating them to payoffs. If private vocational schools survive it is reasonable to assume that these schools operate at a profit and that the private sector of the economy is willing to pay the price of tuition. It is not unreasonable to assume, further, that the buyers of the education find that it pays off. We can also assume that the profit motive will be a sufficient stimulant to the owner of the private vocational school to keep costs as low as possible.

But what controls do we have over the public education? What incentives are there for the public educator to keep his costs down? What evidence is there that public education is being provided efficiently? What evidence is there that the objectives are being achieved?

It is being suggested that these are legitimate questions to ask during a period in our society when there are many demands for the provision of social and merit goods by the government. And, even within education, there are many demands for different forms of education. This means that decisions must be made as to the allocation of resources among competing educational programs. The only appropriate method for making these decisions is on the basis of a cost-benefit analysis.

One aspect of cost-benefit analysis which should be stressed is that it is basically a "way of thinking". It tends, first, to force an administrator to think through his objectives. This does not mean

that the objectives are easy to state. Too frequently they are expressed too broadly and do not reflect the "real" objectives. It is not enough, for example, to state that the schools educate for the so-called "whole man". We must be more specific. Nor can it be stated that, for example, vocational education is designed to place a youngster in a job. Is it a job related to his training? Is it a job solely in terms of an initial placement or are we concerned with the duration of the job? Is it simply the first job or a series of jobs? Is it a job that leads to promotion? Is it a job that is satisfying to the graduate?

Second, cost-benefit analysis, as a "way of thinking", tends to force an administrator to concentrate on costs as well as objectives. The point need not be repeated that inputs and outputs are interrelated.

Third, cost-benefit analysis, as a "way of thinking", forces an administrator to think in terms of "alternatives", that is, to think in terms of alternative ways of achieving the same objective. To refer to the satisfying of wants in the private sector again, it should be noted that the pressures of competition tend to force private enterprise to seek other and better means of producing a good or a service. Similarly, the concentration on alternatives forces the educational administrator to seek other and better means for the education of youth. In this way we can get change and innovation in education. In fact, it is the failure to evaluate educational curricula that leads to stagnation. It is only through constant evaluation that we can obtain innovation.

The above comments are designed to indicate in a constructive manner the logic and meaning of cost-benefit analysis. Despite what appears to be a rather logical case for this type of analysis there is still considerable opposition to the technique. Such opposition reflects, first, certain misconceptions about the method. Second, educators have a different (and erroneous) view of evaluation. And, finally, educators view evaluation as a threat to their institutions. Each of these points will be discussed briefly.

Misconceptions of Cost-Benefit Analysis

One of the most serious misconceptions about cost-benefit analysis is that it is merely a subterfuge for seeking to conduct education on a "least-cost" basis. This is a complete misunderstanding of the notion of efficiency. To an economist efficiency means the achievement of a given objective with the least cost or the maximization of a given objective with a given cost. Efficiency combines both input and output.

A second misconception is that benefit is measured only in dollar terms, and that this is a form of crass materialism. Cost-benefit analysis recognizes that there are non-economic benefits which should be taken into account. Such non-economic benefits may include voting behavior, job satisfaction, cultural values, etc. However, it is essential these objectives should be established on the basis of decisions of the community to determine whether it wants to spend its funds (and how much) for the explicitly stated objectives, economic or non-economic.

A third criticism usually advanced against cost-benefit analysis is that there are some things that are not quantifiable. Presumably, this means that there is no way in which one can determine whether or not a given objective has been attained. If this is so, what justification exists to continue expenditures for objectives which cannot be quantified? Why the assumption that non-quantifiable objectives are automatically good? Although certain objectives may be difficult to quantify, every effort should be made to develop "inferential" (or proxy) indexes. For example, the extent of "interest" of students in a curriculum might be inferred from an index of absenteeism. Psychologists can be of great assistance not only in the development of such indexes, but also in the creation of the necessary instruments designed to compute them.

A fourth criticism frequently mentioned is that the cost-benefit technique has not been fully developed and, therefore, should not be applied. The first part of the statement is correct, but the conclusion does not follow. The fact is that once a decision is made to spend more on, say, vocational education an <u>implicit</u> decision has been made that the benefits exceed the costs. Therefore, the issue is not whether cost-benefit analysis should be applied to vocational education. It is being done every day when an educational administrator decides to spend a dollar on vocational education rather than on another type of education. The only question is whether the vocational education administrator should be required to state <u>explicitly</u> the manner in which he arrived at the decision. When the process of decision-making is made

explicit then others have an opportunity to judge the correctness of the process. It is only in this way that better decisions can be made on the allocation of limited resources for educational objectives. The rejection of an explicit cost-benefit analysis simply means a refusal to expose oneself to an evaluation of a decision-making process. In a democratic society this is unacceptable. In a democratic society the notion that the expert knows best is not tenable.

Fifth, there is a misconception that the cost-benefit analyst substitutes his judgment for that of the decision-maker. The analyst may ask the administrator some pertinent (possibly impertinent) questions. In no instance, however, does he substitute his values for those of the administrator. The analyst simply provides information--costs and benefits--of alternative lines of action designed to achieve the objectives as outlined by the administrator. The analyst simply assists the educational administrator in meeting the objectives of the community in the most efficient manner.

Finally, it is sometimes argued that cost-benefit analysis tends to ignore political considerations. Although the analyst ignores the political aspects of a program it does not necessarily follow that the decision-maker should ignore "politics". This type of analysis will, however, tend to reveal the cost of a political decision and may well tend to minimize the role of politics in the decision-making process.

The Meaning of Evaluation

The literature on the subject of evaluation is overwhelming. And it is not the purpose here to review this literature. However, the term "evaluation" appears to have several commonly accepted meanings. One must make it clear from the outset in what sense the term is employed in order to avoid misunderstanding. In terms of definition, evaluation must be separated from closely related concepts with which it is often confused.

A major distinction must be made between evaluation of individuals and evaluation of processes. Most educators still tend to think of evaluation only in terms of testing, or in terms of discriminating among individual students for administrative or instructional purposes. Indeed, most of the professional literature concerning evaluation uses this concept as its focal point. This probably reflects the fact that most publications in the area have been done by educational psychologists, who are mainly concerned with problems of testing. Another type of evaluation is on an evaluation of the educational process as it is carried out within certain institutions (i.e., within certain schools or school systems). The goal is not the assessment of the individuals but rather the assessment of the progress of all students within a program and the determination of reasons for the relative success of various aspects of this program.

The definitional problem centers around a distinction between measurement and evaluation. To a large extent these two terms are used as equivalents by educators. But the distinction between the two is

important. Measurement implies only quantity, while evaluation implies quantity plus quality. Measurement is a necessary part of evaluation, but evaluation requires both pre-measurement and post-measurement considerations. Before measurement commences, evaluation requires the formulation of a basic educational philosophy (and its attendant goals) and the statement of specific behavioral objectives to be measured. After measurement is completed, evaluation requires (1) the analysis of measured quantities in terms of the attainment of objectives and progress toward goals, (2) an estimate of the value of existing programs in determining this progress and (3) an estimate of the costs involved in the conducting of these programs.

Resistance to Evaluation

We live in a world of rapid change. Within the past half-century, the pace of technological and social change has increased tremendously. In the face of this, the educational establishment still tends to resist change. This resistance is perhaps best exemplified by the rates of development and acceptance of evaluation techniques. The first large scale attempt at evaluation was the National Study's development of the Evaluative Criteria, about thirty years ago. Since then, the criteria have been updated somewhat, but still are largely in their original format. Few other substantial techniques have been devised, and those which are available are utilized mainly for special research projects rather than for ongoing evaluations by interested school districts.

Apparently one of the major obstacles to evaluation research is the interest in the maintenance of a program held by its administrators. Many school administrators seem to view evaluation as an attack upon their institutions, and they erect a shield of defensive attitudes against such an event. This circumstance arises as a result of a failure to separate conceptually the particular educational institution from the process of education which goes on within it. These are two quite different entities, yet both administrators and evaluators too often neglect to view the situation in this manner.

The purpose of evaluation is to point out the strengths and weaknesses of a process, not to police the institutions in which the process occurs. But much of the evaluative effort appears to be just such a policing action. It has been shown that evaluators have been trying to get along with data of an administrative type (such as average class size, average teacher salary, etc.) rather than data of a process type. From these considerations, there would seem to be two paths to greater acceptance of evaluation. One of these is to assure the school administrator that the evaluation is to be used to study the process of education within his school and to help him improve this process, and that it is not to be used for the purpose of making value judgements about his school. The other path to acceptance lies in following up this assurance by utilizing evaluation procedures which really are aimed at collecting only those data relevant to the educational process. In doing so, the evaluator may have to give up some data he would like to have

but the increased acceptance and cooperation should more than make up for this. Much of the data which are presently collected under the guise of evaluation is mainly used to sustain the existing state and national educational bureaucracies; their educational relevance may be quite low.

Furthermore, even when the process is being evaluated little or no consideration is given to costs, a necessary ingredient in any evaluation process.

The remainder of this paper will summarize a recent study of cost-effectiveness of vocational education.

Objectives of Cost-Effectiveness Study

This study of the cost-effectiveness of vocational education had two fundamental objectives. First, it was designed to develop an appropriate methodology for the conduct of such a study. Second, it was designed to obtain data in order to demonstrate the extent to which a study can actually be carried on, and to indicate the magnitude and direction of results. In this paper the former will be ignored and consideration will be given the second objective.

In order to determine the optimum allocation of public resources in education in general and between vocational-technical education and alternative curricula for non-college attending students in particular, measurement is needed of both costs and benefits. Costs by themselves can neither be taken as an indication of quality, nor can benefits be evaluated without taking account of costs. Thus, although costs and benefits are discussed separately, no conclusion as to the worth of the two curricula can be made until the relationship of costs with benefits is considered.

Cost data were obtained from senior high schools in two cities. The current cost of instructing an additional student, that is, the marginal cost, was shown to be greater in the vocational-technical senior high school curricula than the respective costs for the nonvocational-technical senior high school curricula. The difference was between 100 to 200 dollars. Thus, unless the benefit obtained from the vocational-technical senior high school curricula was much greater than from the nonvocational-technical senior high school curricula, it is possible that the nonvocational-technical senior high school curricula are more worthwhile, and should receive a greater allocation of funds. This will be examined later.

An analysis of cost data can also reveal the optimal scale of operation of a senior high school, that is, the level of output, in this case average daily attendance, at which average cost is a minimum. If the statistical results derived in this study are reliable, the optimal scale of size of a nonvocational-technical senior high school is about 3,000 students, although there is a considerable margin of error. No optimal scale of size could be determined for vocational-technical senior high schools because of the small number of observations in this study.

It is important to know the optimal scale of operation because in performing the cost-effectiveness study it is assumed that each school is operating at its most efficient point, and that costs can only be reduced by changing the allocation of funds between curricula, and not by changing the size of the school. Further studies may give greater justification to this assumption.

The benefit data were based on labor market histories reported by mail questionnaires from a sample of high school graduates. Earnings and employment were used as proximate measures of benefit because of the absence of a unique objective measure. After making allowances for variations in the socio-demographic characteristics of the sample, it was shown that nonvocational-technical graduates earned less than vocational-technical graduates during the first year after graduation. By the sixth year, however, the difference in earnings between curricula was slight. Over the long run, the graduate's performance in the labor market is highly related to his labor market experience and socio-demographic characteristics, rather than to the kind of training received in the relatively distant past.

Nevertheless over the six years, given that both sets of graduates have the same socio-demographic backgrounds, vocational-technical graduates earned $3,456 more than graduates of the non-vocational-technical curricula. Similarly over the six years, vocational-technical graduates were employed 4.3 months more than graduates of the nonvocational-technical curricula.

Thus, for the study sample, given that earnings and employment are appropriate indices of the benefit of education, vocational-technical graduates earned significantly more and were employed significantly longer than the graduates of the other curricula during the six-year post graduate period. The vocational-technical curricula, therefore, not only costs more in relation to the nonvocational-technical curricula, but also

yields greater benefit. It is still not possible, however, to determine whether additional funds should be allocated to the vocational-technical curricula or to the nonvocational-technical curricula.

In order to analyze vocational-technical education as an investment in the human agent, the relationship between costs and benefits must be determined when taking account of time, depreciation, risk and uncertainty. Investment criteria are utilized for this purpose. There is no single one which is theoretically or practically correct for all investment situations. Each is limited by a different set of assumptions. In the study, therefore, several criteria were employed. Each of them, separately, showed that additional public funds should be spent on vocational-technical students rather than students in nonvocational-technical senior high schools.

It is asserted by some that students who might normally have dropped out when following the nonvocational-technical program might become successful graduates within a vocational-technical program. In this study the comparison can only be made for students of any curriculum who graduate and those of the same curriculum who drop out. Employment and earnings benefits of the dropouts were measured from the time when they would have graduated.

Over the six-year period, vocational-technical dropouts were employed 11.6 months more than the nonvocational-technical dropouts. The difference in employment between nonvocational-technical graduates and dropouts is greater than the difference between vocational-technical

graduates and dropouts. Thus, while nothing can be said about the dropout saving propensity of the vocational-technical curriculum, one may be able to assert that dropouts from this curriculum fare better in the market place than dropouts from other curricula. However this may be because vocational-technical students drop out in response to a perceived labor market opportunity, and not necessarily because of a fundamental inability to successfully complete high school.

Many consider that one of the major benefits of a vocational-technical school is the ability of these schools to rectify short-run shortages in needed skills. A total of 129 employers were interviewed and their replies indicated that on-the-job training for employees from vocational-technical senior high schools was on the average 12 to 64 weeks shorter than for other employees. For the firms in the sample which had any type of training program, vocational-technical training not only shortened the training program, but also resulted in a higher wage rate while in training. In fact, during the training period it cost employees of vocational-technical graduates about $245 less to receive the necessary training.

Both of the above factors give further justification to the major conclusion of this study--that additional funds should be allocated to the vocational-technical curricula--by indicating further benefits accruing to the vocational-technical curriculum which had not previously been taken into account. A final potential source of bias in measuring benefits to vocational-technical education may lie in non-monetary and non-economic factors. These were also examined.

An improvement in citizenship and an increase in social participation were considered as possible non-economic benefits resulting from different educational curricula. Voting behavior, in the 1966 primary elections and in the 1964 Presidential election, was assumed to be a suitable measure. It was shown that if this assumption is justified, curriculum does not have any significant impact upon citizenship or social participation. Career satisfaction was also considered as a possible benefit. It was shown that vocational-technical graduates had .28 fewer jobs that did not fit in at all with their career interests than did nonvocational-technical graduates. Thus vocational-technical training has in part done what it set out to do--to prepare workers for employment in specific skill areas, so workers do in fact find employment in their areas of training.

The evidence, therefore, suggested that there was little difference in non-economic benefits between vocational-technical and other curricula. Thus, the economic benefits, as discussed earlier, may represent a fairly close estimate of total monetary and non-economic benefits. Again, it can be said that, for the study sample, vocational-technical education is an economically worthwhile investment for individuals and for society.

However, although this study has shown that vocational-technical education is economically worthwhile <u>for this study sample</u>, one cannot necessarily generalize on the basis of these results. If further studies corroborate these findings, then generalizations can be made on safer ground, but considerable refinement is still needed of both concepts and data.